common amongst chemists, of the literature of his special science in all its varied departments. If any of our men wanted a quick reference to either recent or ancient work, it was always "Go and ask Schorlemmer," and they seldom came empty away. But his acquaintance with other sciences was also considerable. If he had not been a distinguished chemist he would have made an equally distinguished botanist. He likewise possessed in full measure that dogged power of work which distinguishes the German. I was especially fortunate in securing his co-operation as co-author of the Treatise. The success of my little book—as to which no one was more surprised than myself—induced me to set about the task of writing a larger and more complete work. I soon found that the other very various and pressing duties of my position rendered it impossible for me to do all the work myself, and my friend Schorlemmer joined me in this somewhat laborious business. To him the organic part almost entirely owes its being, whilst in the inorganic portion his assistance and suggestions were most valuable. We published the book simultaneously in Germany and England, and it is not too much to say that in both countries the work has become a standard one. For the last few years of his life this was his main work. Only those few men who have lately attempted the task of writing even a moderately complete treatise on modern organic chemistry can know what serious labour such work entails. Several distinguished chemists have given up the task as hopeless, and have not completed what they had begun. If Schorlemmer's life had been spared he would have brought his work to a conclusion, cost what it might. Our consolation—and it is but a poor one—at his early death (for he was only fifty-eight), must be that, so far as the chemistry of the hydrocarbons and their derivatives are concerned, his manuscript is complete, and in the hands of Messrs. Vieweg. A mass of material he has gathered together for the remaining organic compounds in which nitrogen occurs as a constituent element. It will be my task to see whether this last portion of the work is complete, and if not, how it can best be brought up to the level of the day.

As a historian of our science, I think that the designation of him by his German friends as the "English Kopp" is a just one. Only a few weeks before his death he talked to me with pleasure of the results of his work on an introduction to the history of chemistry, which had engaged his attention for many months past. Fortunately, he had the rare power of writing so that his manuscript was at once ready for press. Hence, although a fragment, his history so far as it goes—and I believe it goes as far as the end of the eighteenth century—is complete. We shall all look with interest to its speedy publication, and from what I know of the author's works and ways, I shall be disappointed if this fragment does not throw a new light on many dark pages in the early history of our science. One word more as to his character. I have said that we never had a difference, and I believe from what I know of his other friends that they would say the same. He was of a retiring, most modest, and unassuming disposition. To only a few of his intimates, German and English, were his true colours visible. As a laboratory teacher he was excelled by few, merely as a lecturer by many. But although, like some other eminent lecturers, his diction may have been faulty, the staple article was there, and I never met a real student amongst all those who passed through his hands who did not express his admiration for the man, and his sense of the obligation which he felt for the masterly instruction which the Professor always and most readily gave, whilst the long list of honours which his men gained in organic chemistry, both at London and afterwards at Victoria, proved that his teaching was not in vain. True to his science, he valued chiefly the respect and affection of his colleagues and pupils. In society he did not shine. nor did he take any leading part in the government of the College or in the foundation of the University, although those of us who were more active in these matters could always count upon his support in all questions in which the interests of science were concerned, and if he usually preferred to be at his own desk rather than to spend his time listening to the often tedious discussions of the Senate meetings, he was always at hand when a vote was needed to carry out some measure of scientific reform. Although for many years a naturalized Englishman, and enjoying and appreciating English freedom and English ways, he retained more than is usual, a lively interest in the welfare of the "Vaterland." I knew but little of his political views, for these he did not obtrude on his friends, though he held decided ones. He believed in popular freedom and popular rights, and was a strong supporter of the German Social Democratic party, many of the leaders of this movement, both in Germany and in England, being his intimate personal friends. But with these matters we have here little to do. We here have to recognize the scientific work which he has done amongst us, to record our appreciation of that work, and to express the regret of all interested in science at his untimely death.

H. E. ROSCOE.

SCIENTIFIC INVESTIGATIONS OF THE SCOTTISH FISHERY BOARD.

THE Fishery Board for Scotland has issued its Tenth Annual Report (for the year 1891). It is divided into two parts—the general report, and the report on salmon fisheries. We reprint from the general report the passage relating to the scientific investigations carried on since the Board was reconstituted ten years ago:—

The following is a statement of the sums which have been sanctioned during each of the following years and spent by the Board on scientific investigations:—

Year.		Sanctioned.		Spent.
1883–84	...	£300	...	£300 13 7
1884–85	...	1600	...	1430 0 11
1885–86	...	1500	...	1500 0 0
1886–87	...	2000	...	1647 5 3
1887–88	...	2000	...	1843 4 5
1888–89	...	2000	...	1804 4 3
1889–90	...	2000	...	2026 10 0½
1890–91	...	1800	...	1792 13 4
		(With £200 for travelling expenses.)		
1891–92	...	£1800	Do.	

In addition a sum of £2500 was applied in 1886–87 for the purchase of the steamer *Garland*, and £500 per annum allowed for its maintenance, which was increased first to £900, and afterwards to £1200 a year.

When the Board commenced its operations, it was a new departure in State administration. The Fisheries Commission of the United States was only established in 1871, and we were without the experience which has since been gained in America, Germany, Norway, and other countries bordering on the North Sea. The directions of the Act of Parliament creating the Board were very general. We were appointed to "take cognisance of everything relating to the coast and deep sea fisheries of Scotland, and take such measures for their improvement as the funds under their administration not otherwise appropriated might admit of, but without interfering with any existing authority or private right." Hitherto the fisheries had been practically left to take care of themselves. During the administration of the old Board, which had existed from 1809 under the name of the Commissioners of the British White Herring Fishery, scientific investigations had indeed been made from time to time into special points, such as the spawning of the herring, the capture of immature herrings by sprat fishermen, and the action of the beam-trawl on herring spawning-beds. These inquiries were, however, limited both in character and extent, and were merely incidental to certain questions prominent for the time being. The absence of definite scientific knowledge relating to the fisheries had been felt and commented upon by Royal Commissions appointed to enquire into fishing questions; and when the new Board came into existence in 1882, it was found that, without further information as to the habits and life-history of the food-fishes, it would be impossible to submit satisfactory reports to Parliament either as to the improvement or the regulation of the fisheries. It was accordingly resolved that scientific investigations should be instituted under a committee, consisting of Prof. Ewart (Convener), Sir James Maitland, Sheriff Forbes Irvine, and Mr. Maxtone Graham. This committee acted until 1886, when it was dissolved; and, in 1887, another committee was formed, consisting of Prof. Ewart (Convener), Sir James Maitland, Mr. William Boyd, and Mr. W. Anderson Smith, which continued till 1889. Since the dissolution of this committee the scientific work has been under the immediate control of the Board, with Dr. T. Wemyss Fulton as scientific secretary, but all the members feel, and desire specially to acknowledge, the valuable assistance which has been rendered by Sir James Maitland and Mr. Anderson Smith.

Before describing the investigations undertaken, a word must be said as to the means which have been at the disposal of the Board. In 1884 a marine laboratory was established at St. Andrews, with the co-operation of Prof. McIntosh, F.R.S., who was at the time engaged in making scientific investigations for the Royal Commission on Beam-Trawling, under the late Lord Dalhousie; and this laboratory has continued in active operation ever since under Prof. McIntosh's charge. In 1885 another laboratory was erected at Tarbert, Lochfyne, which was placed under the charge of Mr. George Brook, F.L.S., and was occupied until 1887. During 1886-87 a portion of Rothesay Aquarium was made use of, and from 1884 until 1889 part of the scientific work was carried on at the Natural History Department of the University of Edinburgh, under the charge of Prof. Ewart. Subsequently a marine laboratory was built at Dunbar, which has since been added to, and in connection with which the Board are now erecting a large hatchery for the propagation of sea-fish. In addition to the laboratories mentioned, the fishery cruisers have occasionally been engaged in aiding the scientific inquiries, as have also the staff of Fishery Officers around the coast. Since 1886 the small steam-vessel *Garland*, although not at all sufficient for the work, has also rendered important services.

At the time when the scientific investigations were begun very little was known regarding the habits of sea-fishes. Fishermen, who presumably ought to know something of the life-history of the fishes they catch, knew, as Prof. Huxley has remarked, very little beyond the best way to catch them. Yet from the earliest period until comparatively lately, the practice has been to shape fishery legislation in accordance with local desires or the popular opinion prevailing at the time, and not upon ascertained conditions. A study of the statutes dealing with sea fisheries, especially those passed by Parliament from the middle of last century to about the middle of this, shows that vast sums of money have been expended uselessly, and injurious restrictions imposed for reasons which scientific investigations have now proved were illusory. About thirty years ago, however, an important change in this system was effected. Van Beneden on the continent, and Prof. Huxley, Mr. Spencer Walpole, Mr. Shaw Lefevre, and others in this country made a stand against haphazard regulations, and in Great Britain their action found practical expression in the liberating Act of 1868 (31 and 32 Vict. c. 45), which repealed or amended sixty-four fishery statutes, and restored liberty of fishing. The Royal Commissioners who brought about this reform (the late Sir James Caird, Prof. Huxley, and Mr. Shaw Lefevre) refer in their report to the absence of knowledge about the habits of sea fishes, their reproduction, spawning-places, and conditions of existence which is essential to effective regulation of the fisheries.

An indication of the lack of accurate knowledge on these subjects as lately as 1883 was afforded at the London International Fishery Exhibition in 1883, when a high authority thus described the condition of things at that time: "It is a very striking fact that the one point on which all speakers at the conferences held during the past summer at the Exhibition were agreed was this—that our knowledge of the habits, time and place of spawning, food, peculiarities of the young, migrations, &c., of the fish which form the basis of British fisheries, is lamentably deficient, and that without further knowledge any legislation or attempts to improve our fisheries by better modes of fishing, or by protection or culture, must be dangerous, and indeed unreasonable."

It is a source of satisfaction to the Board that their labours in this field of fishery work, even for the comparatively short time over which they have extended, have yielded successful results, and have contributed materially to the advancement of that knowledge of fishery problems, the want of which was felt and deplored by the Royal Commissioners of 1866. The scientific work carried on by the Board, the chief results of which have been described from year to year in their annual report to Parliament, may be summarized briefly as follows:—

(1) Inquiries into the influence of beam-trawling on the fish supply, especially within the territorial waters; the capture and destruction of immature fish by various modes of fishing; the condition of the inshore fisheries for shell-fish and the supplies of mussels and other bait for line fishermen; surveys and examination of the fishing grounds, &c.

(2) Investigations into the food, fecundity, reproduction, habits and migrations of the food fishes, the location of their spawning-grounds, and of the nurseries of young fish, the time and duration of spawning, &c.

(3) The study of pelagic and demersal ova, and of the development of the food-fishes and edible molluscs from the egg onwards.

(4) Inquiries into the micro-organisms in river waters, and associated with salmon disease, and into the food of fishes in inland waters.

(5) Observations on the temperature, salinity, and physical conditions of the sea around the coast.

(6) The artificial propagation of sea-fish and shell-fish to re-stock depleted grounds.

The investigations into the influence of beam trawling, which have been carried on with great regularity and care, have furnished a mass of scientific and statistical evidence unexampled in the history of any fishery, and have been followed by the prohibition of this mode of fishing within the territorial seas. As stated in former reports, various portions of the inshore grounds were for experimental purposes closed against beam-trawling, and by the Herring Fishery (Scotland) Act of 1889, the territorial waters were included in the prohibition, certain powers being reserved to the Fishery Board. Closely related to beam-trawling is the capture and destruction of immature fish, which is generally regarded as the most important of the fishery problems awaiting solution in the immediate future. In certain foreign States and English fishery districts the landing or sale of immature fish under certain sizes has already been made penal; and in 1890 an International Fishery Conference was specially convened in London to consider this subject so far as it affected the diminution of the fish supply from the North Sea. Extensive observations have been made by the Board as to the distribution of immature fish on the east coast of Scotland at various distances from shore and in water of different depths; the minimum size at maturity of the different species and the proportions captured by various modes of fishing, with especial reference to the mesh of trawl-nets, have been ascertained, as has also the action of the beam-trawl in destroying immature fish according to the time the net is down and the nature of the bottom. The results were embodied in a report which was prepared by Dr. Fulton, under directions of the Board, and was described (we believe with perfect accuracy) by the vice-president at the Conference "as one of the most important, if not the most important, document that had up to the present been contributed to the Fishery literature of this country."

The inquiries into the food and propagation of the edible fishes have been also prosecuted on an extensive scale. The food-material of nearly 20,000 specimens caught at various parts of the coast and at all seasons of the year has been examined, and this research has yielded valuable results both in regard to the protection and regulation of the fisheries and the increase of the fish supply by artificial means. The fecundity of nearly all the food-fishes has been determined, the nature of pelagic and demersal ova has been carefully studied, and the distribution of the former in the waters over the breeding grounds and along the coasts investigated. The development from the egg onwards, and the characteristics of the young of the majority of the edible fishes have been described—including the herring, haddock, whiting, cod, ling, turbot, plaice, lemon sole, flounder, &c., and also of the most valuable forms of bait, the mussel and the clam. The spawning of the herring and of the other food-fishes has received special attention. Since 1888 upwards of 30,000 white fish—such as cod, turbot, plaice, &c.—have been individually examined. By this means the time and duration of the breeding season has been determined, and the important fact has been proved that on the east coast of Scotland, where the investigation was mainly carried on, the spawning-grounds of the valuable food-fishes (cod, haddock, plaice, turbot, &c.) generally lie outside the territorial limit—contrary to the belief formerly held—and that only forms of comparatively little value, such as the flounder, dabs, and gurnards, &c., spawn within the three-mile limit. The importance of these facts cannot be overestimated. They bear directly both on the question of establishing a close-time and the measures proper to be taken for the regulation of fishing on the breeding-grounds. The trawlers, driven outside the inshore waters, generally take to the breeding-grounds, for there the hauls are most abundant. The significance of this fact, in connection with the falling off in the inshore fisheries, is becoming too grave to be longer overlooked. The growth of population has been followed by an increase in the demand for fresh fish, the extension of the means of distribution has ministered to this demand, and if the floor of the ocean is to be swept without public regulation, the ordinary fishing-grounds will prove inadequate to maintain the supply. The destruction of spawning fish is proving a serious evil. In Germany, where this matter has been carefully examined, it is now held to be more important to protect the spawning-banks, than to prevent the destruction of immature fish. Some of our fisheries are, in fact, in danger of being exhausted unless judicious regulations are rigidly enforced.

During the last three years experiments have been carried on to determine the migratory movements of fish, and nearly 3000 have been labelled and returned to the sea. A percentage of these has been recovered, and steps are now being taken to apply the same method on a large scale to the herring. The experiments are not sufficiently advanced to justify any final conclusion as regards all fish, but undoubtedly as regards many of them the facts already ascertained prove that until they reach a certain size they do not leave the territorial waters.

The means of increasing the diminishing fisheries for shell-fish have received careful attention. Surveys have been made of the more important mussel-beds on the east coast, the extensive clam-bed in the Firth of Forth, the cockle-beds at Barra, and a detailed examination of the great mussel-growing area in the Clyde is at present in progress. The French system of growing mussels on wattled bouchots has been tested side by side with the bed-system, and a series of experiments have been made on board the *Garland* to test the comparative efficiency of different natural baits, and of various artificial substitutes. A physical and biological investigation has also been made of a number of sea-lochs on the west coast, in order to ascertain their suitability for the growth and culture of oysters (the Scottish oyster having sunk to a very low point), and a special lobster pond has been constructed at Brodick, Arran, in which about 200,000 young lobsters were hatched last year.

The physical observations into the temperature and salinity of the sea have been carried on on board the *Garland* and the fishery cruisers, and at ten fixed stations daily—five on the east coast and five on the west. By the courtesy of the Northern Lighthouse Board, observations are allowed to be taken daily at the Bell Rock and Oxcar Lighthouses, the lightship at the North Carr, and also at the mouth of the Tay. Many thousands of observations are thus made every year, and several valuable reports have already been published.

From this brief summary of part of the work done, it will be seen that considerable progress has been made since 1883 in extending the knowledge of the habits and life-history of the food-fishes; and it is gratifying to learn that the results obtained by the Board have been gratefully acknowledged by high authorities, and found useful in other countries.

In recent years the attention of the authorities of various maritime States, especially those around the North Sea, but also in the Mediterranean and in America, has been forcibly called to the diminution of the fish-supply within the territorial seas and on much-frequented fishing banks off shore. The falling off in the supply of valuable flat fishes, such as turbot, sole, and plaice, from the North Sea, has led to various conferences of those engaged in the fishing industry. At the International Fishery Conference held in London in 1890, at which representatives were present from Germany, Denmark, Holland, France, Belgium and Spain, it was resolved that scientific investigations should be carried on by each country, particularly into the capture and destruction of immature fish by the beam-trawl, prior to the assembling of an official International Conference to deal with the subject by international agreement; and at a conference of representatives of the fishing industry held in London last February resolutions were passed, that in view of the diminution of the valuable food-fishes, the hatching of sea-fish should be undertaken on a large scale, and measures adopted to prohibit the sale of immature flat fishes under a certain size. The decrease in the fish supply from the off-shore banks has not yet become so marked off the Scottish coast as is the case further south; but from the statistics given below as to the yearly increasing number of Scottish beam-trawlers; the flocking northwards of English vessels from their own depleted grounds; and the actual diminution in the quantity of flat fish landed there is reason to apprehend that in the course of very few years a similar result will be brought about here. As has been stated above, the Board are at present having erected at Dunbar, by means of the ordinary vote for scientific investigation, on a site granted by the War Office and the Council of the Burgh, a large hatchery for sea-fish, with the necessary tanks and pumping apparatus, which, when complete, will permit of several hundreds of millions of the food-fishes being hatched every season and planted on the fishing-grounds. It will therefore be possible for the first time in this country to adopt active measures to directly add to the fish supply, as has already been done in the United States, Norway, Canada, and Newfoundland.

NOTES.

AMONG the honours announced at the change of Ministry the Privy Councillorship conferred upon Prof. Huxley not only establishes a precedent, but affords an indication that the neglect of the claims of men of science, whether they be servants of the Crown or not, to the ordinary national distinctions is not likely to be so marked in the future as it has been in the past. Six years ago or thereabouts, Prof. Huxley was allowed to leave the public service without the slightest recognition of the value of the work he had done in many capacities during some forty years. No better way of making the so-called "honours" ridiculous can be found than in generally omitting to confer them upon persons of distinction—persons known to the nation as devoting their lives to the national welfare in some walk or other.

WE have learned with regret a rumour to the effect that th Admiralty has declined to render the assistance in carrying observers and instruments for which the Royal Society made application some time ago to further the observations of the total solar eclipse in Senegambia next April. If this be confirmed, the expedition will in all probability be abandoned. Such a state of things requires no comment of ours.

A MEETING of the Swiss Society of Natural History is announced to take place at Basle, from September 4 to 7, under the Presidency of Prof. Hagenbach-Bischoff, and the following communications have been aranged for:—"The Origin of Swiss Lakes," Prof. A. Heim, Zurich; "The Thermal Conditions of the Lake of Geneva," Prof. F. A. Forel, Morges; "The Biological Conditions of the East-African Steppe," Prof. C. Keller, Zurich; "The Metamorphosis of Alpine Rocks," Prof. C. Schmidt, Basle; "The Evolution of Human and Animal Physiognomy," Prof. W. His, Leipzig; "Studies on the Veddahs, the Aboriginals of Ceylon," Dr. Fr. Sarasin, Berlin. A special invitation is given to foreign students to join the meeting.

ACCORDING to the *Times* a telegram has been received from Tromsö announcing that the *Manche* which left Leith on July 20, for Jan Mayen Island, in the Greenland Sea, reached its destination on the 27th. The island had not been visited for ten years. The vessel went round it and then proceeded to Spitzbergen, where it made important collections of reindeer, foxes, birds, and fossils in Ja Fiord and Bel Sound.